

Minerals and Trace elements



North East Organics Discussion Group Webinar
28th August 2020

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Topics to cover



- Mineral Requirements
- The value of forage mineral analysis and understanding the supply from home produced feeds
- What is an 'organic' mineral? Clarify the difference between organic approval and organic mineral source
- Case studies covering some specific mineral & trace element imbalances
- How to solve mineral problems and manage a derogation request



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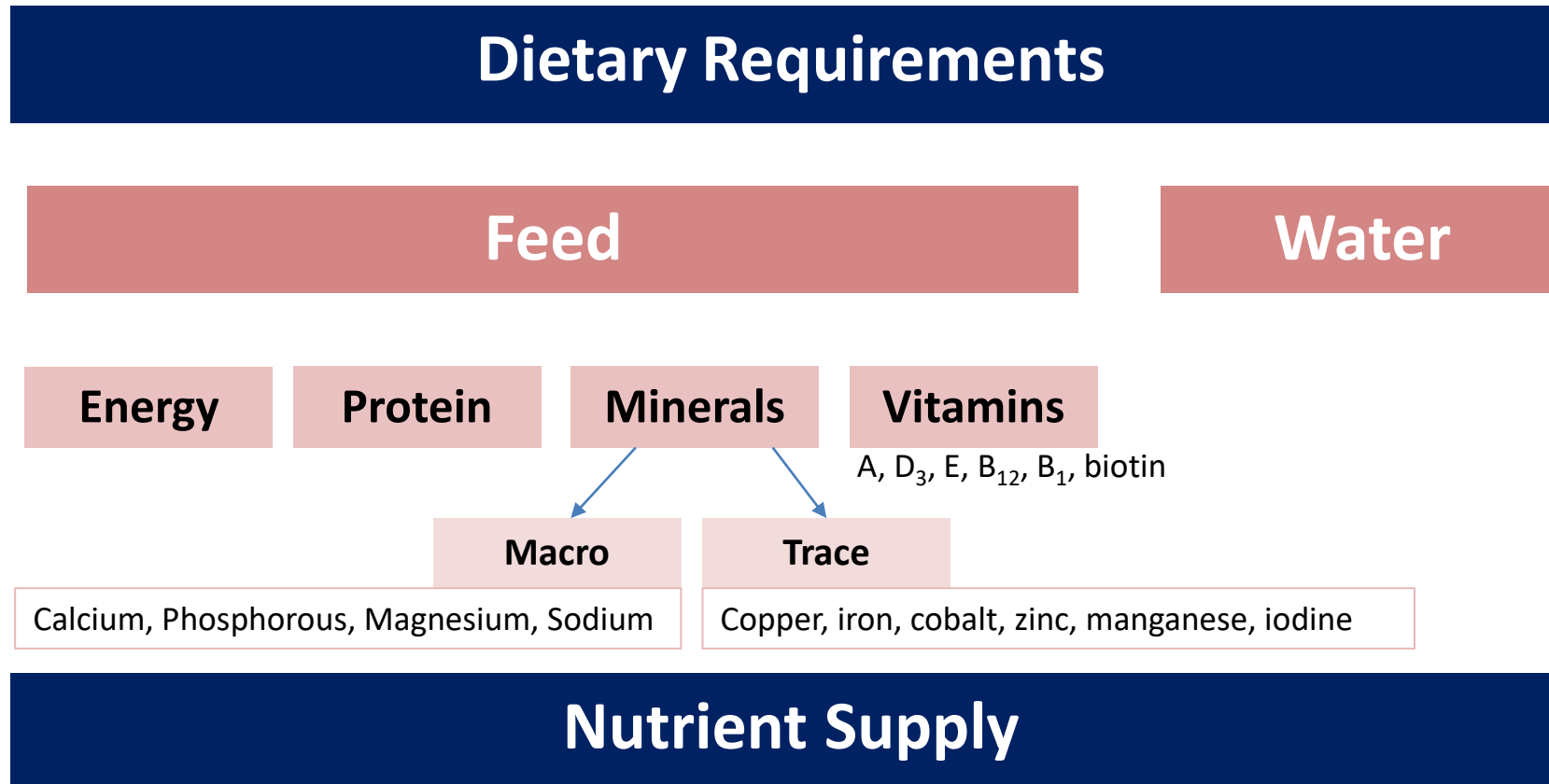


Mineral Requirements

Minerals and vitamins are components of a balanced daily ration



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Roles of Minerals and Vitamins



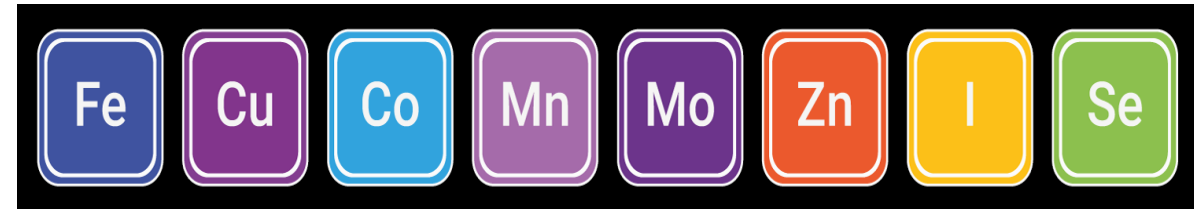
Mineral	Role	Notes
Calcium	Bone & muscle function	Cereals generally poor sources, grass generally adequate
Phosphorous	Bone	Forages tend to be low (particularly late in the season). Distillers grains, and protein supplements high
Magnesium	Bone & nerves	Deficiency can occur when stock on lush grass, high N and K fertiliser increases risk
Salt (Sodium Chloride)	Body Fluid	Need constant supply due to little storage. Stock will consume more salt when on good silage compared to mature silage or high concentrate diet.



Role of Minerals and Vitamins

- **Trace Elements**

- iron, copper, manganese, cobalt, zinc, iodine, selenium
- metabolism
- enzyme activators



- **Vitamins**

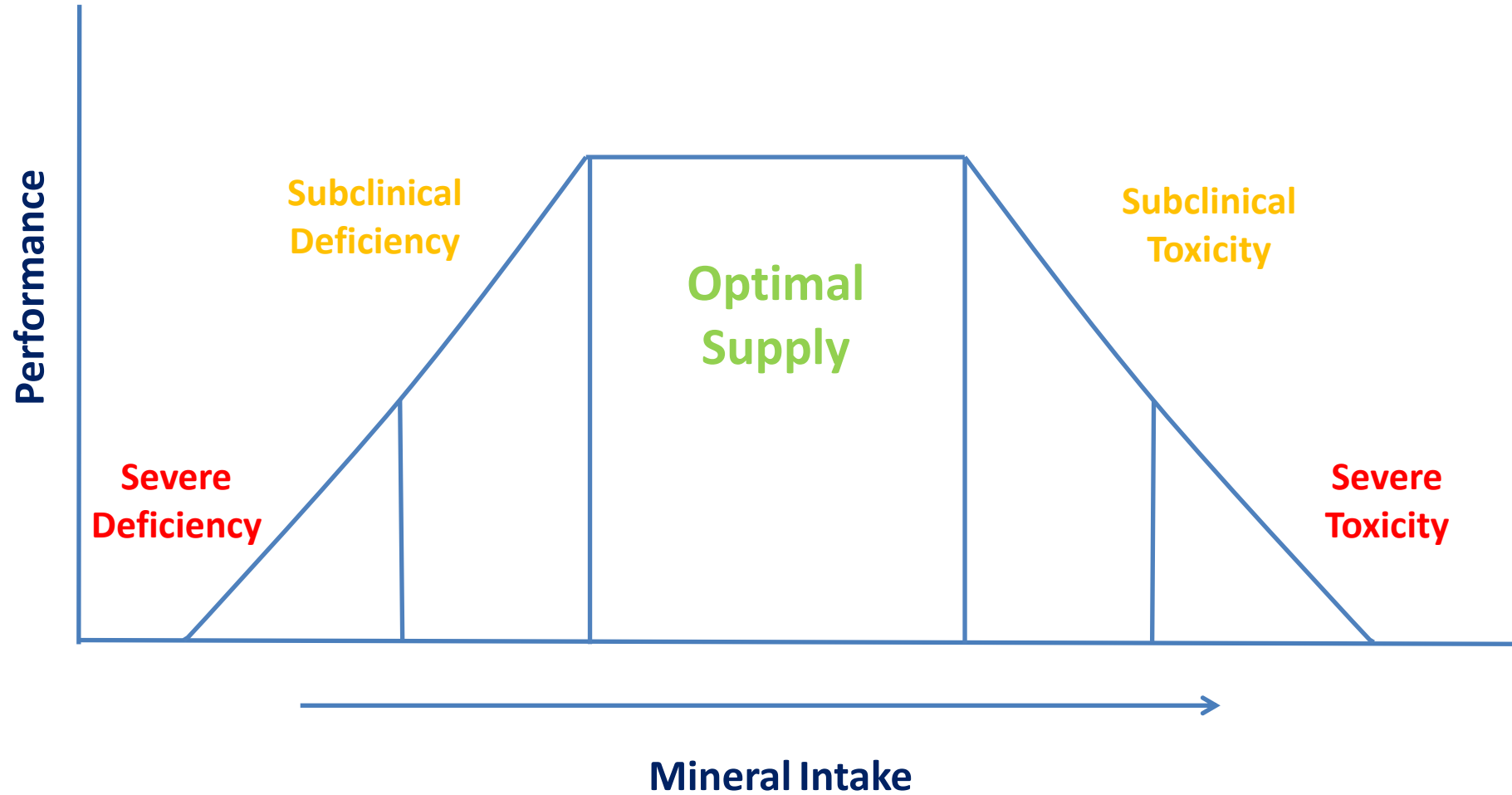
- vitamin A, D₃, E, B₁₂, B₁, biotin
- metabolic function
- antioxidant

Key minerals and vitamins for sucklers



- Magnesium
 - Lock up effect of potassium
 - Staggers
- Iodine
 - Still born calves, poor growth rates, fertility (irregular oestrous)
- Selenium/vitamin E
 - Iodine link, muscle weakness, retained cleansings, fertility
- Copper
 - Anaemia, infertility, poor performance
- Cobalt
 - Rumen production of vitamin B12
 - Energy requirement in rumen and animal

Mineral Nutrition is a balance



Balancing requirement and supply

Requirement

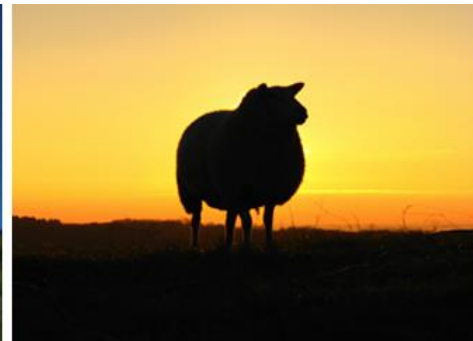
- Maintenance
- Production (liveweight gain, milk yield)
- Pregnancy
- Environment
 - Housing
 - Climate
 - Stress
- Requirements based on dry matter intake
- Published data
 - Limited & old

Supply

- Basal feed- e.g. grass, mixed sward, legumes
- Compound feeds
- Rumen metabolism - vitamin B12
- Additional supplements
 - Powdered
 - Buckets
 - Licks
 - Boluses
 - Drenches
- Antagonists
 - Block uptake – e.g. K and Mg, Mo and Cu
- Supplement sources – differences in availability



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Forage Analysis



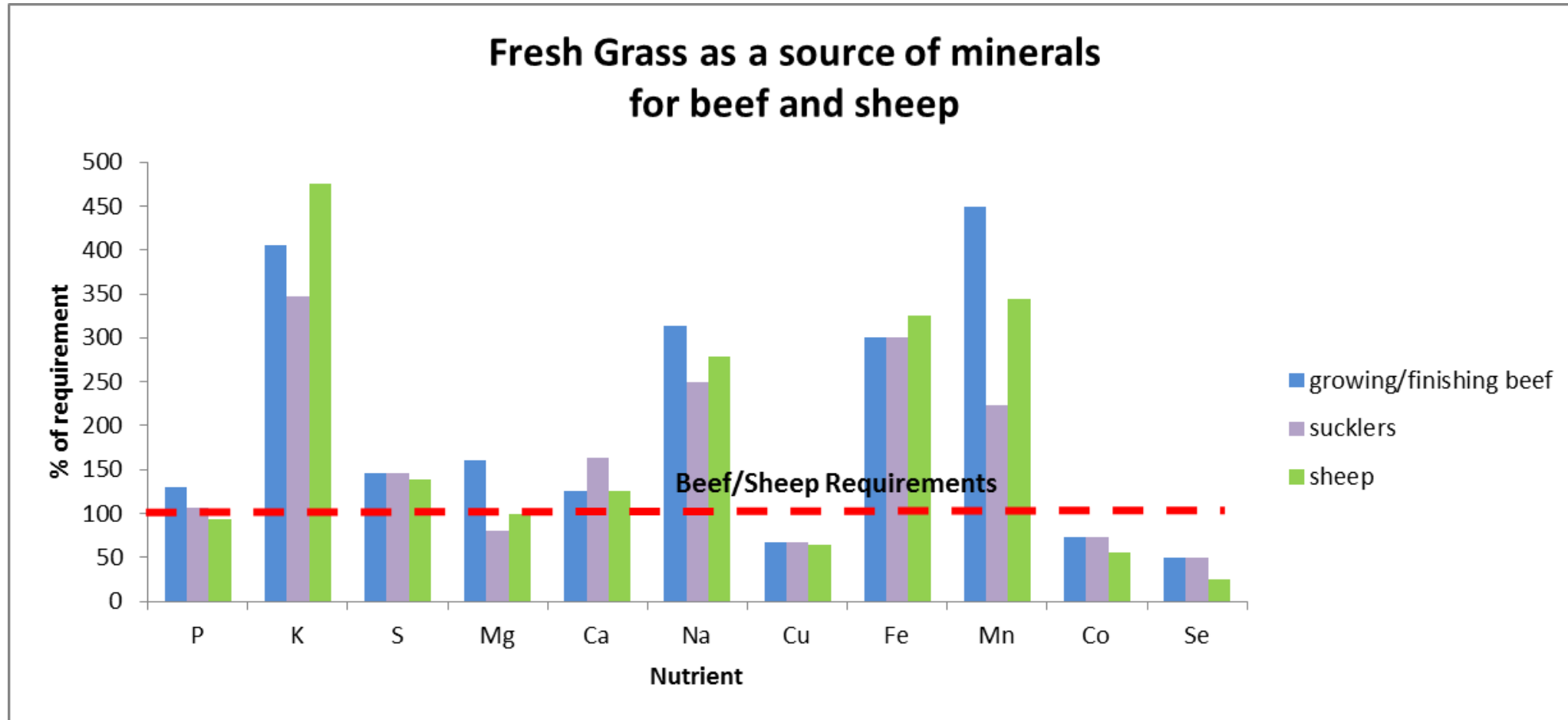
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Question 1

How much does a forage mineral analysis cost?

- A. £10**
- B. £20**
- C. £50**
- D. It's free**

Grass Minerals





Question 2

Which factors affect forage mineral content?

- A. Soil pH**
- B. Pasture biodiversity**
- C. Geographic location**
- D. All of the above**

Natural Sources of Minerals

Plant Type	Examples	Mineral Content
Legumes	 <p>White clover, red clover, Lucerne, sainfoin</p>	<ul style="list-style-type: none"> • High in macro mineral - calcium, phosphorous, magnesium • Higher than grass in trace elements copper, zinc and cobalt
Herbs	 <p>Chicory, plantain</p>	<ul style="list-style-type: none"> • Higher in macrominerals than grasses and legumes

Herbal leys

Mineral Content (g/kgDM)	Chicory	Plantain	Perennial Ryegrass	*Requirements of Pregnant Suckler Cow	*Requirements of 30kg lamb +250g/day
Calcium	14.9	16.6	6	2.1	4.2
Phosphorous	3.4	2.8	3.6	1.2	3.5
Sodium	2.1	8.1	2	0.7	0.7
Potassium	36.4	16.1	20	6	4
Magnesium	2.8	3.2	2	1.2	1.2

*Critical minimum requirements don't account for antagonism, need to look at whole picture

OUTLINE

- What is an Organic Mineral?
- Case Studies
 - Manganese
 - Vitamin D
 - Iodine



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Europe investing in rural areas



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Question 3

Which of the following is Organic?

- A. Salt**
- B. Lime**
- C. Vitamin E**
- D. Water**

What is an Organic Mineral?



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- Time for a little Chemistry lesson?

An **ORGANIC** substance:

- Contains Carbon
- Derived from living matter
- ANIMAL/ VEGETABLE
- Cereals/Forages
- Vitamins
- SOIL

What is an Organic Mineral?



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An **INORGANIC** substance:

- Other elements and their salts
- MINERAL
- Calcium Carbonate/Lime
- Sodium Chloride
- Trace Elements
- SOIL

What is an Organic Mineral?

- By definition MINERALS are INORGANIC
- BUT they can be 'APPROVED NON-ORGANIC'
- By definition VITAMINS are ORGANIC
- BUT they are processed synthetically so not approved for use in organic production UNLESS a derogation, for animal health reasons, is obtained from your CB/DEFRA.
- Confused??
- always check the label and use a trusted adviser

Question 4



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**Do 'Organic approved' supplements
contain vitamins?**

- A. Always**
- B. Never**
- C. By vet approval only**
- D. By derogation only**

CASE STUDY 1 – Vitamin D



- North East Organic Farm – Suckler & Sheep
- 2016 – weak/broken bones @ lambing
- Specific group of hoggs with Ca/Vit D deficiency
- Vet & nutritionist requested a derogation for vitamins to be added to the mineral
- Longer-term ewe lambs sheared before tuppung
 - Increased exposure of skin to sunlight?
 - Vit D is the ‘sunshine’ vitamin so more Vit D
 - 2020 lambing Vits removed without issue.

CASE STUDY 2 – Manganese



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- Congenital Chondrodystrophy of Unknown Origin (CCUO), Long Bone Deformity or Bulldog Calves



CASE STUDY 2 – Manganese



- Cause is uncertain
- Risk factors have been identified
 - Silage only diets
 - Change in diet
 - Stress
 - Month 4-5 of pregnancy
- Is this more prevalent on organic farms?
- WHY?

CASE STUDY 2 – Manganese

- Mn essential in bone development
- Canadian study in pregnant suckler cows, fed 3 forages (Hay, Silage, Red Clover Silage)

	HAY	SILAGE	RC SILAGE
Forage (Mn)	Low	Medium	High
Blood (dam)	High	Medium	Low
% calves CCUO	0	28	38

- Organic approved minerals generally low/zero Mn – has become the norm.

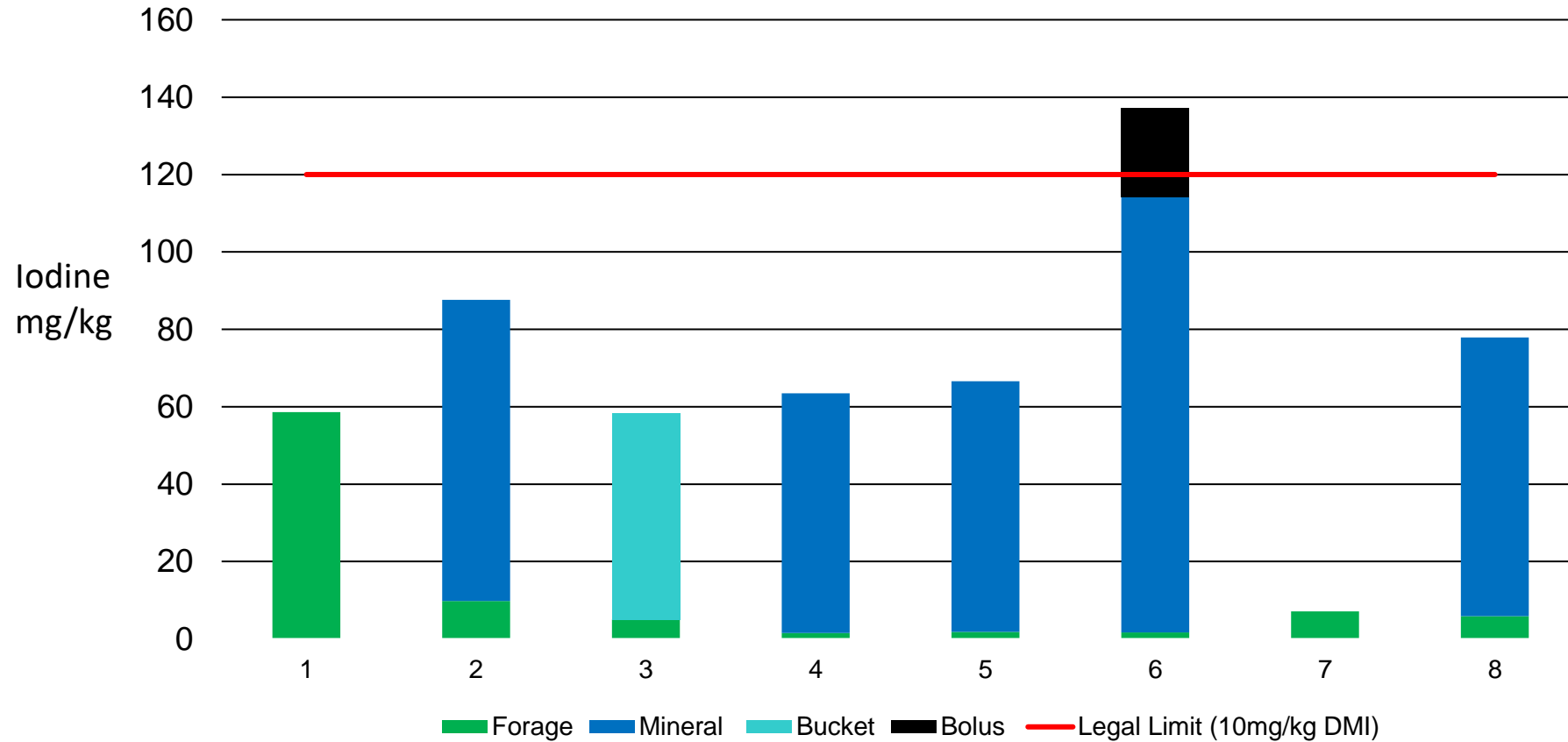
CASE STUDY 3 – Iodine

- Prof T Boland, UCD, over supply of Iodine caused poor colostrum uptake (FPT) in **sheep**
- High incidence of Failed Passive Transfer (FPT) in **suckler & dairy** herds – is Iodine a problem?
- Pilot study Moredun/ Norvite/ LHS, Spring 2018
- 8 suckler farms (cont x) recruited across Scotland:
 - 2 Orkney, 3 N/East, 1 Perthshire, 2 Lanark
 - Mineral budgets including forage

Iodine levels by source



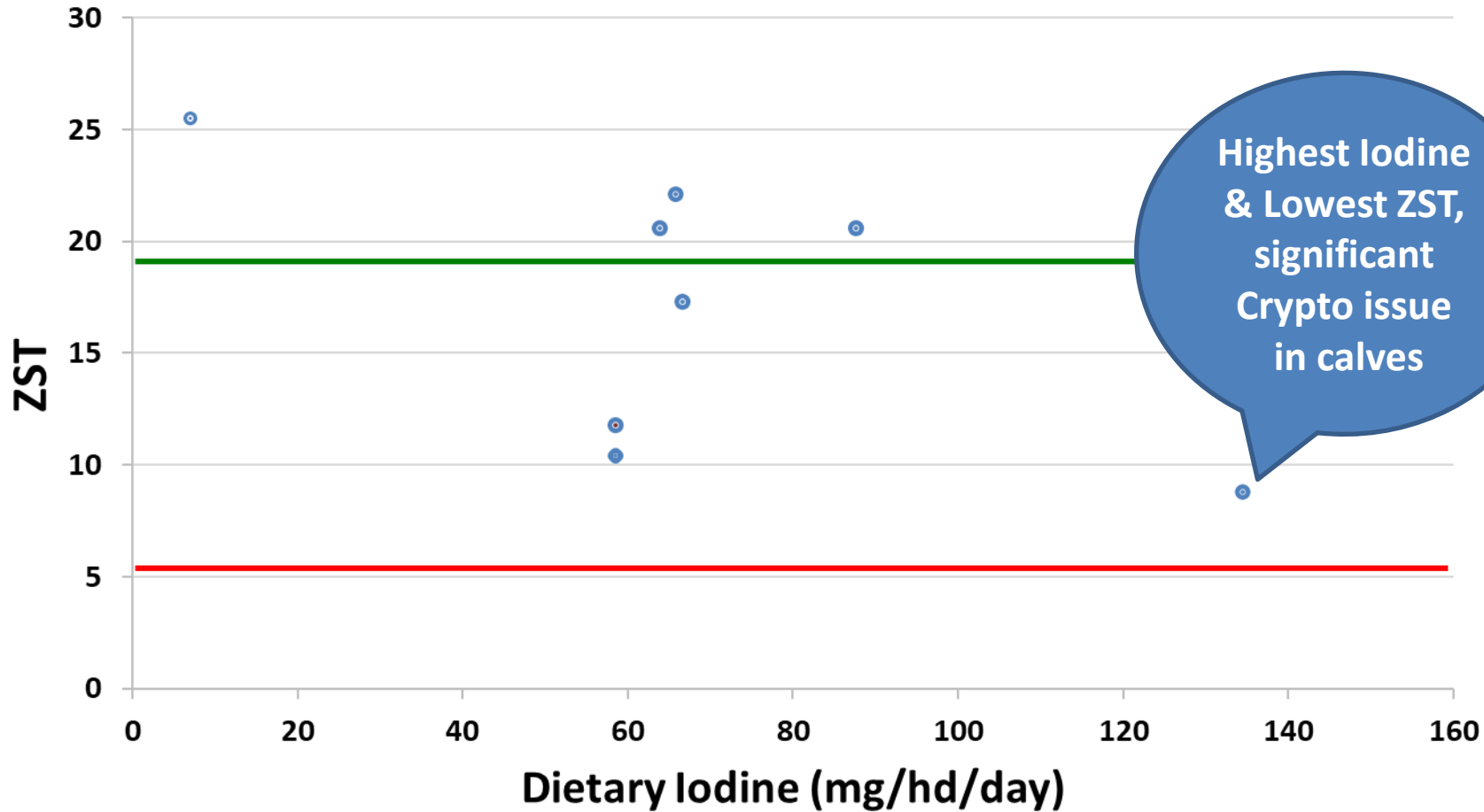
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ZST (antibody absorption)



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CASE STUDY 3 – Iodine

- Supplementation for good and justifiable reasons
- Can you have too much of a good thing?
- **YES!!!**
- Monitor and manage iodine status
 - ensure all supplement sources are accounted for eg boluses, buckets, compounds etc
 - most ‘risky’ period in the 8 weeks prepartum
- Specific issue with Iodine, however all TE need to be in balance



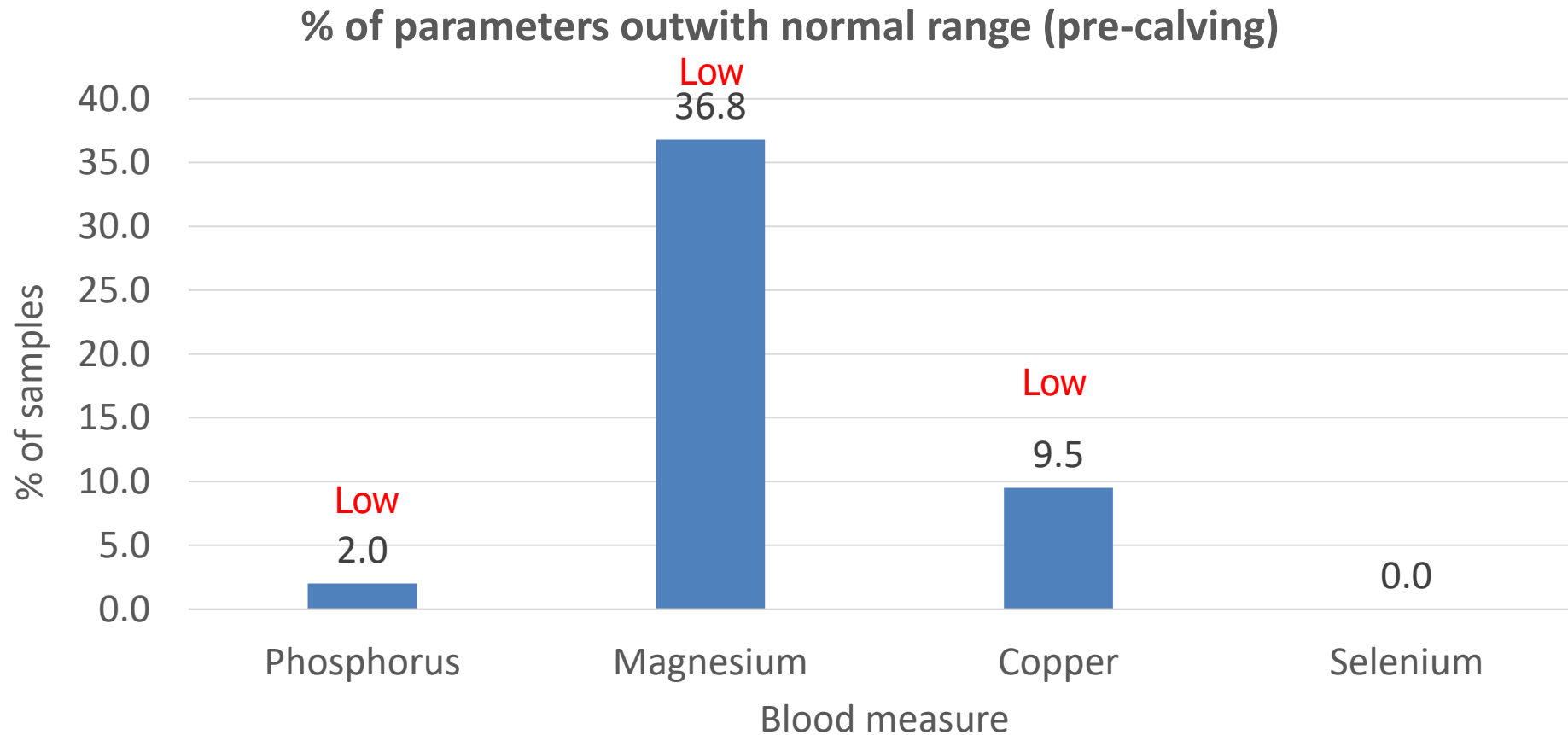
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Case Study

- **Scottish Government funded project on 12 spring calving suckler herds**

Test Results (pre-calving)



Magnesium in pregnant sucklers

Magnesium – if low pre calving:

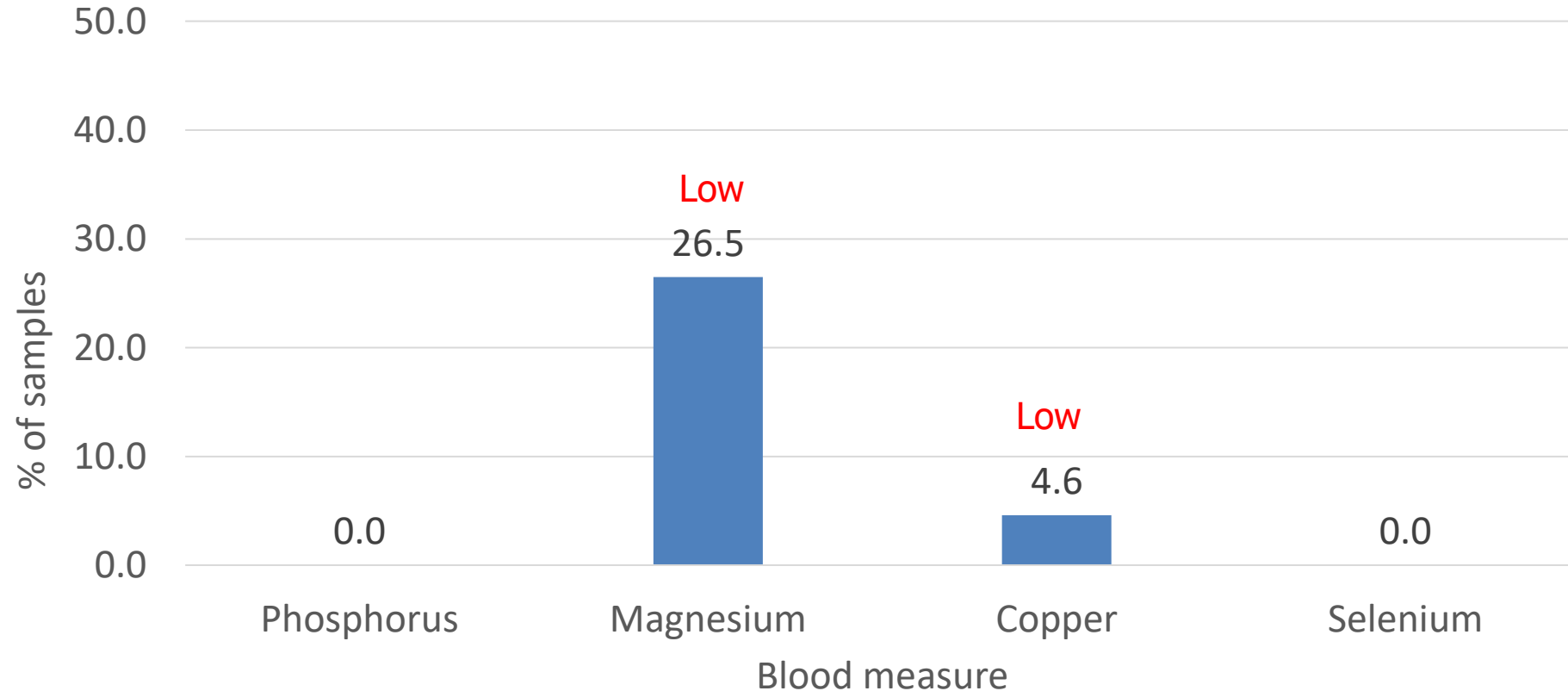
- Helps cows mobilise calcium reserves – meet demand for lactation
 - *Reduces milk fever risk*
- Important for muscle contraction and birthing process
 - *Minimise slow calvings*
 - *Minimise retained cleansings*
- **If low post calving:**
 - Staggers risk

Test Results (post-calving)



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% of parameters outwith normal range (post-calving)



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Plasma Iodine (reference range 50-105µg/litre)



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Farm	Iodine (µg/litre) Pre-calving	Iodine (µg/litre) Post-calving	Trace Element Bolus
1	108	-	Yes
2	>150	>150	Yes
3	97	137	Yes
4	92	-	No
5	>150	77	No
6	>150	>150	No
7	106	93	No
8	>150	>150	No
9	>150	>150	No
10	-	64	No
11	>150	>150	No
12	109	105	Yes

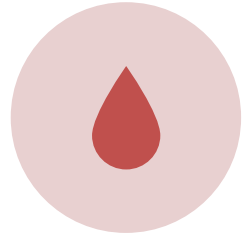


Identifying a deficiency and managing derogations

Identifying a deficiency - Building up a picture



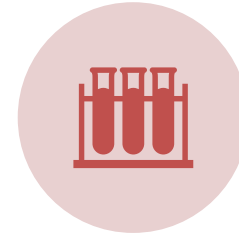
FORAGE ANALYSIS



WATER ANALYSIS



ANY OTHER
SUPPLEMENTS IN
THE RATION



BLOOD TESTING



LIVER BIOPSY

How to solve mineral issues

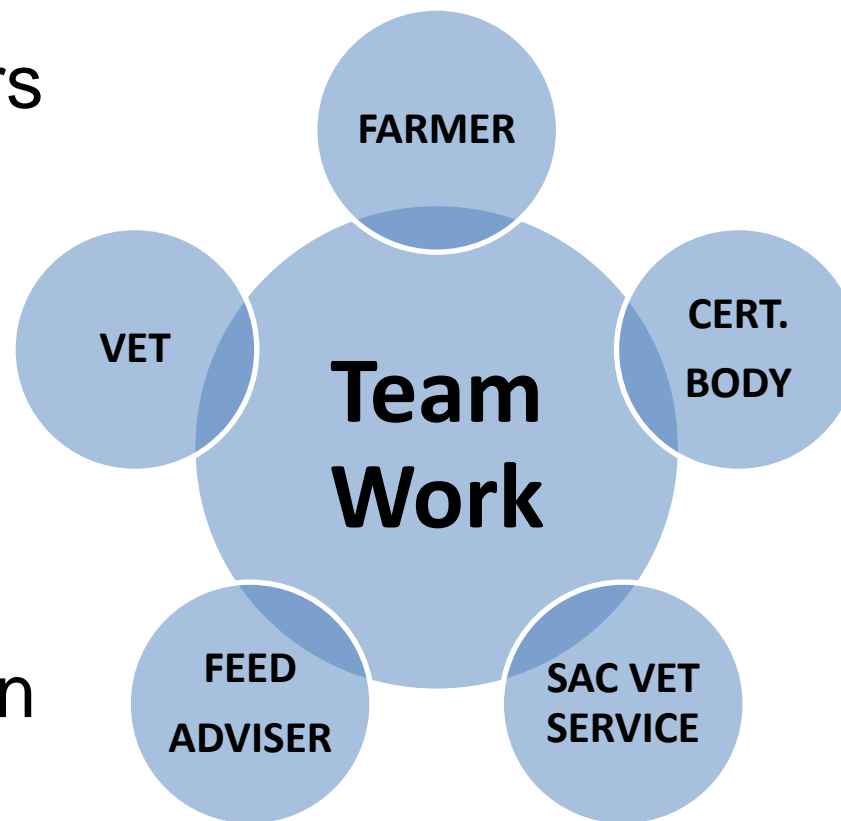
- Estimate contribution from forage

Mineral	UK	Norvite	%
Sodium	0.31	0.23	0.74
Copper	7.45	5.70	0.77
Cobalt	0.21	0.09	0.43
Selenium	0.05	0.03	0.60
Iodine	0.86	0.63	0.74
Molybdenum	1.47	1.58	1.07

- Target specific/non-specific performance issues

Managing derogations

- Work with trusted advisers
- Build an evidence base
- Justify need and work on mitigations
- Derogation reviewed annually
- HERD/FLOCK health plan



Thank You



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